Claims

1. (allowed) An automatic gain controller for an imaging system capable of producing successive frames of images, wherein said imaging system has an illumination source, said automatic gain controller comprising:

means for receiving frames of images and converting each of said frames into pixels in which each pixel has a brightness value;

means for counting the number of pixels of each frame of the image which have a brightness value above an upper threshold to provide a first value, the number of pixels of each frame of the image which have a brightness value below a lower threshold to provide a second value, and the total number of pixels of the frame;

means for comparing the first value with a third value representing a first percentage of the counted total number of pixels, and comparing the second value with a fourth value representing a second percentage of the counted total number of pixels; and

means for providing one or more signals to the imaging system capable of directing the imaging system in accordance with said comparing means to reduce the power to said illumination source when the first value is greater than the third value and the second value is greater than the fourth value, and to increase the power of said illumination source when the second value is less than the fourth value and the first value is less than the third value.

2. (allowed) The automatic gain controller according to Claim 1 further comprising a computer system which operates the illumination source in accordance with said signals.

3. (allowed) The automatic gain controller according to Claim 1 wherein said signals are digital signals and said providing means further comprises means for producing an analog signal based on said digital signals to said illumination source to adjust the power of the illumination source.

4. (allowed) The automatic gain controller according to Claim 1 further comprising means for limiting said pixels counted by said counting means to ones of said pixels in a region of each frame of said images.

5. (allowed) The automatic gain controller according to Claim 1 wherein said comparing means is enabled after each said frame received.

6. (allowed) The automatic gain controller according to Claim 1 wherein said first percentage is about 12.5% and said second percentage is about 50%.

7. (allowed) The automatic gain controller according to Claim 1 wherein said brightness value of each pixel ranges from 0 to 255, and said first threshold is about 250 and said second threshold is about 10.

8. (allowed) An automatic gain controller for an imaging system capable of producing successive frames of images, wherein said imaging system has an illumination source, said automatic gain controller comprising:

means for receiving frames of images and converting each of said frames into pixels in which each pixel has a brightness value;

means for counting the number of pixels of each frame of the image which have a brightness value above an upper threshold to provide a first value, the number of pixels of each frame of the image which have a brightness value below a lower threshold to provide a second value, and the total number of pixels of the frame; and

a computer system coupled to said illumination source for controlling the illumination provided by illumination source in accordance with said first value, said second value, and the counted total number of pixels.

9. (allowed) The automatic gain controller according to Claim 8 wherein at least said counting means in operative over less than the entire frame of each of said images.

10. (cancelled)

11. (currently amended) The system according to Claim ~~10~~ <u>17</u> wherein said characteristic is brightness of the displayed image.

12. (currently amended) The system according to Claim ~~10~~ 17 wherein said optics represent confocal optics and said detecting means represent confocal detecting means.

13. (currently amended) The system according to Claim ~~10~~ 17 wherein said system is adapted for imaging by one of confocal microscopy, optical coherence tomography, and two-photon microscopy.

14. (currently amended) The system according to Claim ~~10~~ 17 wherein said object represents tissue.

15. (currently amended) A ~~The~~ system ~~according to Claim 10~~ for imaging an object comprising:

a source for illumination;

optics for scanning the illumination to the object and receiving returned illumination representing at least one section of the object;

means for detecting the returned illumination and forming a signal representative of an image of the section of the object;

means for displaying said image of the section of the object in accordance with said signal; and

means for automatically controlling the intensity of said illumination source in accordance with a characteristic of the displayed image, wherein said means for automatically controlling said illumination source comprises:

means for providing pixels representing at least part of the image in accordance with said signal in which each of the pixels has a value;

means for counting the number of pixels of each frame of the image which have a value above an upper threshold to provide a first value, the number of pixels of each frame of the image which have a value below a lower threshold to provide a second value, and the total number of pixels of the frame;

means for providing a third value representing a first percentage of the total counted pixels;

means for providing a fourth value representing a second percentage of the counted total pixels; and

means for adjusting the power to said illumination source in accordance with said first, second, third and fourth values.

16. (original) The system according to Claim 15 further comprising means for limiting said pixels counted by said counting means to ones of said pixels in a region of each frame.

17. (currently amended) A ~~The~~ system ~~according to Claim 10~~ for imaging an object comprising:

a source for illumination;

optics for scanning the illumination to the object and receiving returned illumination representing at least one section of the object;

means for detecting the returned illumination and forming a signal representative of an image of the section of the object;

means for displaying said image of the section of the object in accordance with said signal; and

means for automatically controlling the intensity of said illumination source in accordance with a characteristic of the displayed image, wherein said means for automatically controlling said illumination source comprises:

means for providing pixels representing at least part of the image in accordance with said signal in which each of the pixels has a value;

means for counting the number of pixels of each frame of the image which have a value above an upper threshold to provide a first value, the number of pixels of each frame of the image which have a value below a lower threshold to provide a second value, and the total number of pixels of the frame; and

a computer system coupled to said illumination source for controlling the illumination provided by illumination source in accordance with said first value, said second value, and the counted total number of pixels.

18. (original) The system according to Claim 17 further comprising means for limiting said pixels counted by said counting means to ones of said pixels in a region of each frame.

19-20. (cancelled)

21. (currently amended) A The system according to Claim 10 17 wherein said means for automatically controlling said illumination source is enabled for each successive ones of the image to effect the characteristic of said successive ones of the image on the display.

22-24. (cancelled)

25. (allowed) A method of controlling an illumination source of an imaging system capable of producing successive frames of two-dimensional images, wherein said imaging system has an illumination source, said method comprising the steps of:

a) receiving frames of images and converting each of said frames into pixels in which each pixel has a brightness value;

b) counting the number of pixels of each frame which have a brightness value above an upper threshold to provide a first value;

c) counting the number of pixels of each frame which are below a lower threshold to provide a second value;

d) counting the total number of pixels of each frame;

e) providing a third value representing a first percentage of the counted total number of pixels;

f) providing a fourth value representing a second percentage of the counted total number of pixels;

g) comparing the first value with said third value;

h) comparing the second value with said fourth value; and

i) controlling an illumination source of the imaging system which produced said frames of images in accordance with said steps (g) and (h) to reduce the power to said illumination source when the first value is greater than the third value and the second value is greater than the fourth value, and to increase the power of said illumination source when the second value is less than the fourth value and the first value is less than the third value.

26. (allowed) The method according to Claim 25 wherein said steps (b) through (d) are operative over less than the entire frame of each image.

27-30. (cancelled)

31. (currently amended) A ~~The~~ system ~~according to Claim 10~~ for imaging an object comprising:

a source for illumination;

optics for scanning the illumination to the object and receiving returned illumination representing at least one section of the object;

means for detecting the returned illumination and forming a signal representative of an image of the section of the object;

means for displaying said image of the section of the object in accordance with said signal; and

means for automatically controlling the intensity of said illumination source in accordance with a characteristic of the displayed image, wherein said means for automatically controlling said illumination source comprises:

means for receiving frames of images and converting each of said frames into pixels in which each pixel has a brightness value;

means for counting the number of pixels of each frame of the image which have a brightness value above an upper threshold to provide a first value, the number of pixels of each frame of the image which have a brightness value below a lower threshold to provide a second value, and the total number of pixels of the frame;

means for comparing the first value with a third value representing a first percentage of the counted total number of pixels, and comparing the second value with a fourth value representing a second percentage of the counted total number of pixels; and

means for providing one or more signals to the imaging system capable of directing the imaging system in accordance with said comparing means to reduce the power to said illumination source when the first value is greater than the third value and the second value is greater than the fourth value, and to increase the power of said illumination source when the second value is less than the fourth value and the first value is less than the third value.

32-34. (cancelled).

35. (allowed) An automatic gain controller for an apparatus capable of producing successive frames of images, in which each of said frames represents pixels having values, said automatic gain controller comprising:

a first counter for counting the number of pixels of each frame which have a value above an upper threshold to provide a first value;

a second counter for counting the number of pixels of each frame of the image which have a value below a lower threshold to provide a second value;

a first comparator for comparing the first value with a third value;

a second comparator for comparing the second value with a fourth value; and

circuitry coupled to said first and second counters and said first and second comparators for logically comparing said first value with said third value and comparing said second value with said fourth value and based on the results of such comparisons providing one or more signals for one of increasing, decreasing, or maintaining the gain, wherein said one or more signals reduce the gain when the first value is greater than the third value and the second value is greater than the fourth value, or increase the gain when the second value is less than the fourth value and the first value is less than the third value.

36-37. (cancelled)

38. (currently amended) An automatic gain controller for an apparatus capable of producing successive frames of images, wherein each of said frames has pixels having a brightness value, said automatic gain controller comprising circuitry for counting at least the number of pixels of each frame of each image which have a brightness value above an upper threshold to provide a first value, and the number of pixels of each frame of each image which have a brightness value below a lower threshold to provide a second value, in which the gain is controllable in accordance with at least said first value and said second value, wherein the gain is reduced when the first value is greater than the a third value and the second value is greater than the a fourth value, or the gain is increased when the second value is less than the fourth value and the first value is less than the third value.